

# **LR 314 Working Group 5 Final Report**

## **I. Nebraska Department of Natural Resources**

**Table 1. NDNR and NATURAL RESOURCES COMMISSION WATER/INTEGRATED MANAGEMENT PLANNING RELATED RESEARCH, STUDIES AND RELATED REPORTS 2004 TO DATE - DRAFT 9/2/11\* (\*Dollars Approximate, Some Studies Not Included as Noted) – prepared by DNR.**

### **a. What types of data/science do the DNR use and how is it funded?**

DNR uses the types of data/science that enable the agency to better understand water movement and use in Nebraska. Since 2004 the data/science used by DNR has been generated in part by studies that focus on understanding non-beneficial consumptive water use by riparian vegetation; the availability of hydrologically connected water supplies; streamflow, streamflow trends, and streambed characteristics; groundwater availability and recharge; land use; water use by tilled and untilled fields; weather; the impact of water conservation and other best management practices on streamflow; and water management.

Regarding funding, data/science is often funded and generated through collaborative partnerships. Some studies are conducted by DNR staff and, as such, are funded by state dollars. Others are conducted using federal funds (i.e., Bureau of Reclamation, EPA/NDEQ/ARRA); Nebraska Environmental Trust funds; and partner funds and/or in-kind support (i.e., Natural Resources Districts, Republic River Management District Association, center pivot manufacturers, University of Nebraska).

For detailed information, see Table 1.

### **b. What studies or research is the DNR conducting and for what purpose?**

See Table 1.

### **c. How does the DNR determine that it is using the best available science?**

In its integrated management planning duties, the Department collaborates with its partner agencies in assessing and evaluating available, credible, and applicable data and science in the context of their joint goals and objectives. For instances regarding duties that are the sole responsibility of the Department; it relies on its staff of engineers and scientists, with occasional assistance from outside entities or authorities in pertinent fields of expertise, to assess and evaluate available, credible, and applicable data and science in the context of its responsibilities under the law and in accordance with its rules.

## **II. Nebraska Natural Resources Districts**

### **d. What types of data/science do the NRDs use and how is it funded?**

**Table 2. NRD Research and Data Gathering Efforts Completed, Continuing, or Started in the Last Five Years – prepared by the NRDs.**

NRDs use various types of data/science depending upon their local needs. To varying degrees, NRDs use the types of data/science that enable them to:

- Better measure and understand: groundwater quality and quantity; weather; evapotranspiration; geology; detailed elevation contours; infiltration rates; groundwater and surface water interactions; aquifer characteristics and vulnerability; streamflow, streamflow trends, and streambed characteristics; nitrogen management; non-beneficial consumptive water use by riparian vegetation; annual irrigated acres; canal leakage; economic impacts of water management; land use; impact of livestock waste in a watershed; impacts of land use change on water quality and quantity; conservation practices; endangered species' habitat needs; effectiveness of modeling and data collection techniques; actual irrigated corn production data against theoretical potential maximums; water budgets; and historical, current, and future water use.
- Develop: integrated management plans; water and watershed management tools; wellhead protection plans; hazard mitigation plans; regional water supplies; hydrologic and hydraulic models; cost-benefit analysis; land use planning and decision-making tools; water accounting geographic information systems; and river flow enhancement projects.
- Promote water use efficiency and improve water management

Regarding funding, data/science is often funded and generated through collaborative partnerships. For detailed funding information, see Table 2.

**e. For what purposes are the NRDs required to do research?**

NRDs are required to collect data that is used to identify water quality and quantity trends, which are then used to determine and implement rules and regulations. The goals of these rules and regulations are sustainable use of available groundwater resources.

### III. Other Entities

#### **f. What other entities conduct water research related to Nebraska and for what purposes?**

Federal agencies both conduct and fund water research related to Nebraska; and while this research may be conducted in Nebraska, it generally must be transferrable and therefore beneficial to areas outside Nebraska. While some federal requests for proposals and/or applications target specific regions, most are highly competitive and not targeted in scope so that this research is always directly applicable to Nebraska's research needs.

In addition to the Nebraska Department of Natural Resources and Nebraska's Natural Resources Districts, other entities conduct and fund water research related to Nebraska, including local governments, associations, foundations, industry, and other agencies and universities.

- **Federal agencies –**
  - i. **US Geological Survey**

**Table 3. US Geological Survey – Nebraska Water-related Research Publications – provided by the USGS Nebraska Water Science Center.**

ii. Others TBD

- **Universities –**

**Attachment A. List of University Funding Sources (developed using UNL water faculty research funding sources).**

#### **Federal Funding Sources**

- i. **National Science Foundation (NSF)**

**Table 4. National Science Foundation Awards – Active and Expired for non-NU Faculty (Keywords: High Plains Aquifer, Nebraska, water) – prepared for this report.**

- ii. **National Institutes of Health (NIH)** – information available via the National Institutes of Health Research Portfolio Online Reporting Tools (RePORT) Reports, Data and Analyses of NIH Research Activities

#### **State Funding Sources (beyond DNR)**

- **Other Entities** – for example, private consulting firms, member groups, and agribusinesses, generally in partnership with other entities. Partnerships are noted in the tables previously provided.

**g. How are those projects run and how are they funded?** Federal and university projects are generally funded by federal sources and are run by project officers within the respective funding agencies, under the supervision of the agency director. In some cases, federal funders require or prefer that these funds be matched with state, local or private dollars. Some projects are privately funded.

**h. Are all of these research projects shared between entities?**

- Made available as public information
- Made available by request
- Often made available only when completed

**i. What are the reasons water research might not be shared among parties, particularly the DNR and NRDs?**

- Any research and studies possessed by the Department are publicly available to the extent allowed by law.
- Research may not be applicable to all partners – research is shared when it is of interest to the partner
- Research may be tied to litigation and not available for public use

**j. How does the University of Nebraska assist the state with meeting its research obligations?**

**Table 5. University of Nebraska-Lincoln Water-related Research - Funded Projects (2001-2011)**  
– provided by the University of Nebraska – Lincoln Office of Research. Includes All Research for All Those on the University of Nebraska Water Center "Water Faculty" List.

(Additional information available via the NU Water-Related Research Database - <http://watercenter.unl.edu/researchdb/researchdb.asp>)

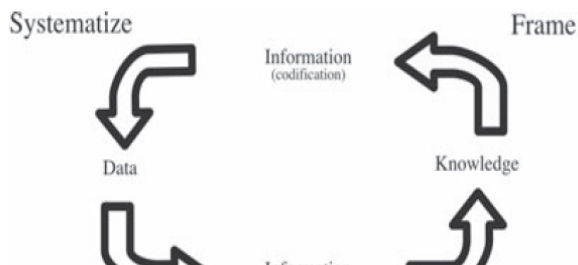
The University of Nebraska assists the state with meeting its research obligations in the following areas:

- **Data** – faculty and staff collect data and maintaining databases. They also conduct research to improve the methods and protocols used to collect data. For example, the High Plains Regional Climate Center operates 201 Automated Weather Data Network stations in 10 states. The Conservation and Survey Division maintains the Nebraska Statewide Test-hole Database and Quality-Assessed Agrichemical Contaminant Database for Nebraska Ground Water. In 2005 the Center for Advanced Land Management Information Technologies mapped agricultural patterns for the entire state; this project was funded by DNR. These data examples are all available to the public via websites.
- **Information** – faculty and staff give relevance and purpose to data by interpreting what the data means, mostly in journal articles and reports available to the public in print and electronically. For example, groundwater level data is used by CSD to develop groundwater-level change maps and reports.

The **data** and **information** provided by the University of Nebraska and many others is utilized by those who make decisions and manage Nebraska's water resources, both as private individuals and on behalf of public institutions. **Knowledge** is derived from the decision-making process. This knowledge is then used to better understand and articulate data and information needs. This continuous process builds better understanding of natural and human conditions (aka, reality) and builds wisdom; see diagram. (Michaels, 2006)

- **Identify State Research Needs** – In 2006 the University of Nebraska Water Resources Advisory Panel (WRAP) was created, initiated a comprehensive survey of the state's water research needs, and developed a state water research priorities list. The WRAP updated and re-ranked this list in 2009; these results were then communicated to faculty. Fifteen individuals representing a cross section of the Nebraska water decision-making community continue to serve on the WRAP and provide guidance to the University of Nebraska on state water research needs, education, and outreach programs.

All these components work together in a cycle of “organizational reasoning.” **Knowledge becomes data** when components are better understood and classified, thus leading to systematic methods of collecting and classifying data. For example, test hole data is used to identify differences in substrata, thus developing a systematic classification system (codified information) which is subsequently used to analyze additional test hole data.



**Data becomes knowledge** when it is analyzed and interpreted. Systems and relationships are better understood, thus giving meaning to the data. The challenge is to synthesize and apply this knowledge to decision-making.

#### **IV. Other Issues**

##### **k. What are the issues relating to the Missouri River Master Plan?**

The Master Manual is a water control plan that guides how much water the U.S. Army Corp of Engineers should release from the six reservoirs on the Missouri River Basin, when and for how long. The Master Manual hydrology (runoff volume, timing, shape of watershed, etc.) is based on over 100 years of historical runoff records (1898-2004).

The Corps revised the Master Manual in 2004 following a 14-year period of public involvement to balance all the competing uses for the Missouri River and to serve all the purposes for which it was authorized and constructed. Input was derived from residents and farmers who live along the Missouri River, in addition to local, state, and federal elected officials. Hundreds of alternatives were analyzed and considered during this process. In 2006, a secondary spring pulse revision was added.

Each fall, a draft annual operating plan is developed to provide stakeholders information on the expected results of the operation of the reservoir system for the coming year under widely varying water-supply conditions. The draft plan is also circulated in the fall, and public meetings are held through the Missouri River Basin to gain input from the public and tribes. Based on input received, the plan is finalized and released, generally in December.

The biggest issue relating to the Missouri River Master Plan is that fundamental differences exist between the upper and lower basin states. Upper basin states are generally concerned that steady water levels are maintained in the spring so that fish can spawn in the reservoirs, thus supporting the region's recreation interests. Lower basin states, especially Missouri, have historically been concerned about operating the reservoirs to maintain navigation in the river.

To a large degree Nebraska's issues associated with operations of the Missouri River relate to:

1. Flood control and protection.
2. Amount and timing of hydropower availability to Nebraska municipal and public power customs.

3. Amount of Gavins Point releases from a timing and quantity perspective (Annual Operating Plan) as it relates to:
  - a. Municipal water supply needs
  - b. Industrial and power plant water supply and cooling water needs
  - c. Ability to optimize utilization of barges for transporting agriculture supplies and products
4. Implementation of Endangered Species Act Biological Opinion from an effect on operations flood control as well as biological enhancements.
5. Implementation of studies and other activities associated with:
  - a. Bank stabilization, maintenance and mitigation
  - b. Master Manual review studies
  - c. Ecosystem Recovery

In 2011 a combination of heavy snowpack in the Rocky Mountains and record May rains in Montana, the Dakotas and part of Wyoming caused half a million acre-feet per day of water to flow into the upstream reservoirs for 11 days. While these upstream reservoirs still had storage space available, they were overwhelmed. The Corp released water that caused prolonged and widespread flooding, with repair costs likely to top \$2 billion.

In September 2011 the Army Corp of Engineers commissioned a study of how the agency handled its management of the Missouri River. A four-person review panel, made up of hydrologists from the National Weather Service, the USGS, and the Natural Resources Conservation Service, and a retired Colorado State University professor of civil engineering, should finish their review by early December 2011.